

# High Gain, Very Low Areal Density, Scalable RF Apertures Enabled by Membrane Aperture Shell Technology (MAST), Phase I

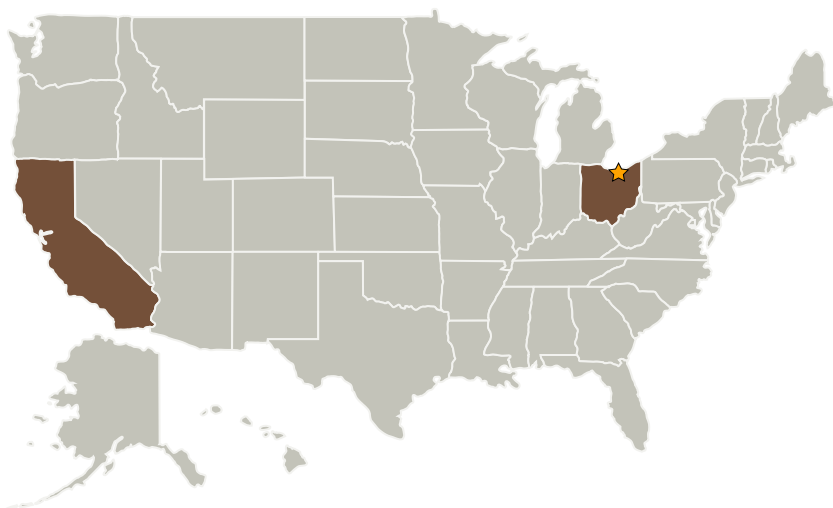
Completed Technology Project (2007 - 2007)



## Project Introduction

We propose that the Membrane Aperture Shell Technology (MAST) approach be expanded with a specific focus on space exploration orbiting comm network RF aperture applications. The approach is based on a proven combination of 1) thin film materials with space heritage, 2) inherent low areal density (40 to 200 g/m<sup>2</sup>), 3) structural shell stiffness provided through the induction of permanent curvature, 4) sufficiently low surface roughness and thickness variation (verging on optical grade), and global figure to satisfy all RF wavelength operations, 5) proven RF reflectivity, 6) compact stack or roll stowage, 7) robust passive self deployment with stowed strain energy, and when needed, 8) compatibility with boundary control/adjustment to provide initial phasing, rigid body fine pointing and environmental disturbance effect rejection. Recent advances in shell fabrication technology enable easily scaleable aperture systems based on hexagons segments. By optimizing local segment figure and alignment large scale on axis (or even off axis) parabolas can be adequately approximated. In the PI we will demonstrate fabrication of suitable hexagon shaped segments, determine optimal system architectures, confirm RF performance, numerically show sufficient stiffness in the face of environmental and launch loads, review figure mitigation and control techniques. This prepares the way for a detailed PII focused on demonstrating performance in realistic environments (TRL 6), a key step in any realistic commercialization plan for space hardware.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Glenn Research Center (GRC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Mevicon, Inc.	Supporting Organization	Industry	Sunnyvale, California

Primary U.S. Work Locations	
California	Ohio

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.2 Observatories
    - └ TX08.2.1 Mirror Systems